

## **Chapter 6**

### **CERCLA Feasibility and RCRA Corrective Measures Studies**

#### **6-1. Background**

Feasibility studies (FS) and corrective measures studies have the common objective of developing a set of alternative remedial actions which are potentially able to be accomplished at the LLRW or MW site and which will mitigate or negate the hazards the waste site poses to the general population and the environment. Because of this commonality, the FS and CMS will be described together. Potentially appropriate remedial plans are developed in two phases: identification and initial engineering conceptualization of potentially valid remedial measures; and first-level screening evaluations of the identified remedial alternatives. These phases of identification and initial feasibility evaluation will be conducted concurrently with the ongoing remedial investigations. The remedial alternatives will be developed using the data and interpretations from those remedial investigations, i.e., the concepts will be in a constant state of change as new data are incorporated and their feasibilities will also be adjusted continually to reflect knowledge of the site as it becomes available.

#### **6-2. Remedial Action Objectives**

The objectives of the general body of possible remedial actions will be stated. The purpose of those objectives is to state the goals of environmental-medium-specific ways to protect human health and the environment or the goals of source-specific ways to protect health and environment. Specifically, identified hazards or risks will be mitigated by discrete actions. Pathways of contaminant transport may be severed or redirected, the sources of the contaminants may be stabilized or removed, or other actions may be taken. Contemplated actions will be specifically directed to defined hazards and assessed risks. Contaminants, specifically radioactive waste, will be specified, pathways of transport will be delineated, potential receptors vulnerable to the hazards will be specified, and acceptable contaminant levels will be quantified for each source/pathway/receptor combination. Those acceptable levels will be determined by regulation or by assessed risks.

#### **6-3. General Response Actions**

These actions are broad classifications of actions or combinations of actions that will satisfy the objectives of remedial actions as described above. General response actions will be developed for the specific MW site and source conditions. Examples of these general response actions are no action, institutional controls, disposal, extraction, excavation, containment, and treatment. Site and waste characteristics will be identified during investigations and will weigh heavily in developing general response action descriptions.

#### **6-4. Identification of Potential Remedial Technologies**

Each general response action identified will have a list of potential remedial technologies developed for itself. Each item on those lists of technologies will address the particular site and waste characteristics as identified in the remedial investigative report. Those technologies for which there are alternative processes will be further described addressing each of those optional processes as they pertain to the subject site. The process option descriptions will be the most basic subdivisions of remedial technology descriptions in the feasibility study. There are many potential technological areas and many possible processes within each technological area. New processes are being developed or are being adapted to new applications; this process development and selection is the point of application of engineering to environmental restoration.

#### **6-5. Evaluations**

The characteristics of particular LLRW sites as revealed by the remedial investigations may indicate that certain of the technologies and process options that have been identified as potential are, in fact, not suitable. Each process option of each potential remedial technology that addresses each general response action must be evaluated. This evaluation effort will be ongoing, continuous, and is intended to keep remediation resources and attention concentrated on the best potential remedial actions for the site. Criteria of effectiveness, ability to implement, and cost will be used to evaluate the process options.

## 6-6. Collation of Remedial Alternatives

Preliminary remedial alternatives will, after having been screened as described above, be assembled on the basis of the specifically targeted environmental media they have in common and the MW sources they have in common. This collation is intended to gather together all the process options and technology types to examine them on a common, site-specific and site-wide basis. Again, as in other stages of the feasibility study process, the objective is to satisfy the requirement to protect humans and the environment while keeping the range of alternatives limited and focussed on the problem at hand. Innovative technologies and processes may be applicable and should be considered, though without either special preference or prejudice. Some technology types will demonstrate only one viable process. Some technologies will have multiple process options that are applicable to the particular site; at this stage of feasibility study it is not necessary to carry along many similar processes so long as documentation allows reconsideration at a later time. The following minimum set of alternative action types will be developed if at all possible:

a. *No action.* There will be an examination of the “no-action” alternative which is performed on an equal footing and with equally rational methods to all other alternative remedial actions.

b. *Containment.* One or more alternative actions will be developed that involve containment of the MW with little or no change in its inherent nature.

c. *Treatment.* One or more alternative actions will be developed that involve changing the inherent nature of the MW in such ways that human health and the environment are no longer threatened by it. Some hazardous toxic components can be treated to make them not hazardous. The radioactive components cannot be treated to lessen their radioactivity, though the passage of time allows the radioactivity to decrease naturally. MW treatment can change the physical characteristics of the waste in such ways as to make it much less mobile, for example, thus reducing the threat to populace and environment. Vitrification or incorporation in grout are examples of this type of treatment.

d. *Waste removal.* The transport of the MW offsite for disposal is an alternative providing it satisfies specified remedial action requirements and satisfies DOT regulations of transport.

## 6-7. Additional Data Needs

Throughout the development of alternative remedial actions there will arise needs for more data. Those requirements must be identified and documented. The requirements for additional data must be classified as being critical to definition of the site/MW conceptual model or needed for alternative remedial action criteria. Data directly affecting understanding of contaminant distribution, transport, and concentrations are critical to the conceptual model against which the entire remedial program is designed. Sensitivity analyses may be used to determine if certain data needs are critical. Some data needs will require additional special-purpose investigations.

## 6-8. Feasibility Study Report

The identification and initial screening of remedial technologies will be reported. The development of alternative remedial alternative actions will be reported with the results of the initial screening of those alternatives. Those general subjects will comprise the feasibility study report. The report will include a summary of the background site information as reported from the remedial investigations. The nature and extent of the contamination will be described, together with a definition of the environmental media primarily addressed by the remedial alternatives. Each environmental medium of concern specified will be assigned preliminary remedial action objectives and will have general response actions identified. Potential remedial technology types will be identified and screened for applicability and accomplishment potential. Within each technology type the individual process options will be identified, matched to the site and environmental objective, and documented. Process options, technologies, and general response actions will be assembled into a range of remedial alternatives addressing the MW site rehabilitation objectives, and that assembly will be documented in the report. The methods by which the alternative action set was assembled will be reported. Impacts to the alternatives by regulatory controls will be described and necessary actions listed. Data that need to be incorporated in the remedial investigations will be documented. In the feasibility study report, there will be a complete definition of each alternative including the extent of remediation, the quantities of material involved in the actions, time estimates, required resources, and similar information sufficient to assess the feasibility of the alternative. The ground rules and bases

for assessing feasibility will be reported. Initial screening evaluation results will be summarized.

#### **6-9. Detailed Analysis of Remedial Action Alternatives**

Additional phases of remedial investigations and feasibility studies are not explicitly required but may be necessary for large, or complex, or critical site restorations. Those phases of investigation and study will be increasingly more tightly focussed on specific problem areas and process evaluations. When all detailed analyses of technologies and processes are complete, the final feasibility study report will address nine criteria for each reported alternative remedial action. These criteria will serve as the basis for selection of the best protective and cost-effective remedial action. The nine required criteria for feasibility assessment are as follows.

*a. Short-term effectiveness.* This criterion addresses the following:

(1) Protection of the community during construction and implementation of the remedial action.

(2) Protection of workers during construction and implementation of the remedial action.

(3) Environmental impacts during construction and implementation of the remedial action.

(4) Time to elapse before the remedial action objectives are achieved.

*b. Long-term effectiveness and permanence.* This criterion addresses the risks remaining after the remedial action objectives have been met. These subjects include:

(1) Magnitude of the remaining risk from residual or untreated waste.

(2) Adequacy of controls required to manage residual or untreated wastes.

(3) Reliability of controls required for residual or untreated waste.

(4) Degree of permanence of the remedial action.

*c. Reduction of toxicity, mobility, or volume.* This criterion addresses, explicitly, the toxic component of MW. Implicit inclusion of the radioactive component must be made by association with full realization that the

hazard of radioactive waste exists whether or not the regulatory language addresses it specifically. Generally speaking, radioactive materials cannot be changed to make them less radioactive. However, their physical forms can be changed to make them structurally and chemically more stable and less mobile. Specific factors include the following:

(1) Treatment and stabilization processes, their methods, and the materials they will address.

(2) The amount of MW that must be treated, stabilized, or disposed of.

(3) The degree of expected reduction in toxicity, mobility, or volume or increased physical or chemical stability.

(4) The degree to which treatment or stabilization is irreversible or the retrievability of disposed waste.

(5) The type and quantities of residual material that will remain.

*d. Implementability.* Both technical and institutional adequacy of an alternative remedial action will be addressed.

(1) Technical feasibility will include construction and operation of the alternative, the reliability of the particular technology, the ease of combining additional remedial actions, and the ease and completeness of monitoring efforts in the presence of the alternative.

(2) Adequacy of the alternative in the light of regulatory and other institutional controls.

(3) The availability of services and materials needed by the alternative.

*e. Cost.* Costs for the alternatives will be analyzed and compared based on a single figure for a common year. Reasonable and uniform discounting rates will be established for a probable period of performance of the remedial action. Sensitivity analyses may be used for costing feasibility studies so long as the practice is uniform among the alternatives.

*f. Compliance with regulatory controls.* Detailed analyses will summarize federal and state standards, requirements, criteria, and limitations that may be applicable, relevant, and appropriate to an alternative. The manner by which the alternative addresses the

standards, requirements, etc. will be described. Pertinent waivers will be specified.

g. *Overall protection of human health and the environment.* This is the ultimate criterion as it explicitly arises from the objectives of both the CERCLA and the NEPA. Each source of contamination will be related to the alternative as well as each pathway of transport. Pursuant to the NEPA, the potential environmental impacts of any alternative should be addressed in the feasibility study report. There will be a final assessment of the risks to the general public and to the environment which will arise from the mitigated hazard.

h. *State acceptance.* This assessment will be preliminary in nature and consist only of fully documented prior comments by state agencies. Final acceptance by the state can only occur following the state review of the feasibility study report.

i. *Community acceptance.* As with state acceptance, assessment of community acceptance of particular alternatives can only occur in final form after review of the feasibility study report. Preliminary comments, if formally documented and if arising from the impacted community and special interest groups, may be included.